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SURVEYING AND MAPPING REQUIREMENTS FOR MODERN CITY PLANNING

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SURVEYING AND MAPPING DIVISION

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PAPERS

SURVEYING AND MAPPING REQUIREMENTS FOR MODERN CITY PLANNING

By Charles A. Blessing,[1] Assoc. M. ASCE

Synopsis

The city planning profession is giving increased attention to the improvement of techniques and to the refinement of standards and criteria. Since surveys and accurate maps are the prerequisites of intelligent planning, it follows that, as the process itself is refined and perfected, so must the basic tools be refined. Planners must be alert to exploit new technical developments which will facilitate the preparation of these basic tools. Two major contributions in the field of urban surveying and mapping have been the development and perfection, largely since World War I, of aerial photography and photogrammetry and the development by the American Society of Civil Engineers of universally recommended procedures for the making of engineering surveys of cities.

Although prepared as long ago as 1934, ASCE Manual No. 10[2] continues as the best available statement on surveying and mapping for modern city planning. The emphasis in this handbook is on the making of city surveys rather than on the specific application of such surveys to problems of city planning. Manual No. 10 might well be supplemented by a basic manual covering the techniques and applications of aerial photography and photogrammetry to the economical and time-saving solutions of many city planning problems. A further supplement might be a definitive statement of surveying and mapping requirements for modern city planning from the point of view of the city planner who is the user of the survey rather than from that of the civil engineer who makes the survey.

Note.—Written comments are invited for publication, the last discussion should be submitted by August 1, 1951.

[1] Director, Planning Div., Chicago Plan Comm., Chicago, Ill.

[2] "Technical Procedures for City Surveys," *Manual of Engineering Practice No. 10*, ASCE, New York, N. Y., 1934.

Purpose of Paper

This paper is intended to stimulate thought and promote further study which might lead to such a definitive statement, with proper emphasis placed on the opportunity for a much broader application of aerial photography and photogrammetry in the solution of city planning problems.

Surveying and mapping requirements for modern city planning must be derived from an examination of standard planning techniques. Although considerable progress has been made in the development of city planning procedures since the 1920's, it must be recognized that city planners today continue to work under the handicap of an infant science. The different planners or offices use varied procedures and different classifications in surveys and studies, and all too often follow no rational standards that have been, or can be, adequately documented and justified.

Because of the increasing demands placed on a planning program to provide a master plan or official map as a specific guide for the expenditure of public funds for capital improvements, the planner has had to proceed from the general to the specific. Decisions of great importance in connection with vast redevelopment programs, superhighway programs, park, and school building programs have been thrust into the hands of the planner. Increased responsibility must be matched by increased performance. Clearly the time has come when city plans must be documented with fuller reasons for each step in the procedure leading to specific recommendations, whether for land use or for services pertaining to land use.

Webster's Dictionary defines science as " * * * accumulated and accepted knowledge which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws * * * ." In their daily work and through the professional organizations, planners are formulating their ideas on city planning and reducing their principles to language. They have begun to experiment in framing a body of doctrine as a guide for more precise techniques for city planning. Careful study of the effective work being done by planning agencies, individual planners, and research groups leads to the conclusion that gradually, almost imperceptibly but surely, modern city planning is developing as a science.

Since each city is different from any other city and conditions of growth are variable and uncertain, no formalized techniques or outline of procedures can be more than a general guide. It is important, therefore, that procedures that can be reduced to a statement of principle should be formulated and that proved techniques should be established as standard practice for the encouragement of sounder planning throughout the United States. It should be emphasized that planning is more than the carrying out of specified techniques. Oliver Wendell Holmes' warning—"If a doctor hasn't got plenty of good common sense, the more science he has the worse for his patient"—applies with equal force to the city planner.

The Development of Standard Planning Procedures

Since surveying and mapping requirements are determined largely by the procedures and the scope of the city planning program, the logical approach

to the mapping problem is to outline those procedures for the broad categories of planning studies which taken together constitute standard planning practice. The determination of the type of map or engineering survey required in each study is suggested by the broad classification of data required. For the major metropolitan regions of the United States or for a specific smaller city or town, it is usually possible to specify a desirable scale or range of scales commonly accepted for each type of map, the degree of accuracy required, the terminology and categories of classification of data, the detail required on the maps, and the choice of method for preparing the needed surveys and maps, based on cost, accuracy, time required in preparation, and range of use. Obviously, no two cities, even if approximately the same size, will require exactly the same kind of surveys and maps, and cities of widely varying size may require a still wider variation in maps and surveys

Essential Planning Studies

The specific mapping requirements for the different phases of city planning can be classified under twelve broad headings:

1. Geography, Topography, Geology, and Natural Resources.—For this basic study, the standard topographic survey map, as specified in Manual No. 10,[2] provides most of the necessary information. In addition to describing physiographic features, this section provides information on the underground geologic structures of the urban region and on the climatic conditions. Problems of water supply and drainage can appropriately be presented here or under the heading of public utilities.

Few large urban regions in the United States have adequate topographic maps. In a pioneer study, the New York (N. Y.) Regional Survey,[3] with the aid of the United States Department of the Interior, secured an enlargement of the United States Geological Survey map, which was made in 1923, and amplified this map by data from limited field surveys and aerial maps. The report stated:

> "The cost of making an accurate map showing all physical features based on field surveys would have been greater than the cost that has been incurred in making the whole Regional Survey and Plan–a map showing accurately the physical characteristics of the region, including its artificial features of railroad, highway, and buildings, its natural forests, swamps and water areas, and its contours to distinguish its hills and valleys is still an unfulfilled want."

Enlargements of the Geological Survey quadrangles on a scale of 3 in. = 1 mile are available in sheets, each covering 22 sq miles. The plan is reproduced on a scale of 1 in. = 1 mile. The contour interval is 20 ft. In contrast with this early regional map, the Pittsburgh, Pa., regional maps use a 2-ft contour interval and the Cleveland, Ohio, Regional Geodetic Survey provides 2-ft contour intervals on a scale of 1 in. = 200 ft.

The topographic map specified in Manual No. 10 is on a scale of 1 in. = 200 ft, with a 2-ft contour interval, and with a minimum of 1 ft for flat areas.

[3] "Population, Land Values and Government," Regional Survey of New York and Its Environs, New York, N. Y., Vol. II, 1929, p. 219.

The topographic map shows ground contours; drainage features, such as lakes, rivers, marshes, creeks, ponds, wooded areas; and cultural features, such as buildings, pavements, property lines for streets and alleys, railroads, and bridges. Accuracy is indicated by the requirement that horizontal positions of 90% of all well-defined cultural and drainage features on the map are within from 0.01 in. to 0.02 in. of their true positions, and that the indicated elevations of 90% of the points are within one half of the contour interval of the correct elevations.

2. *Land-Use Studies.*—Real property surveys have been made in more than 250 cities in the United States since 1930. These surveys, largely standardized, generally followed the recommendations in the "Technique for a Real Property Survey" which was prepared by federal agencies in 1935.[4]

The base map is similar to the standard city survey topographic map, with the exception of the contour lines which have been removed and the individual lot lines which have been added. The monumental undertaking of the Chicago (Ill.) Land-Use Survey in 1939 was based on maps covering 238 sq miles (available as work sheets on a scale of 250 ft to the in. on 27-in. by 34-in. sheets) and also on nine single-line maps on the scale of 3 in. = 1 mile (bound in a 9-in. by 12-in. volume). The scale of 250 ft to the in. has proved entirely satisfactory for study purposes. Experience with these maps for 10 years has indicated a high degree of reliability as to both land-use information and base-map features. A scale of 1 in. = 200 ft is usually recommended. The Chicago land-use maps (scale 250 ft to the in.) are conveniently related to the wall maps with scales of 1 in. = 1,000 ft and 1 in. = 2,000 ft. The following maps were reproduced in the final report of the Chicago Land-Use Survey[5]: Base maps; land coverage; dwelling ratio (area per dwelling unit by blocks); present zoning; block data (eight factors on land use in block); economic area; problem area; transition area; median volume ratio; exempt areas tax; areas of nonconforming use; and areas of less restricted use.

In addition, other maps of the land-use survey include land use, growth trend, improved value, predominant use, number of persons per acre, land value as a percentage of total value, median area of use, and percentage of all structures in poor condition.

The continuously revised Sanborn Atlas maps,[6] with some sheets on scales of 1 in. = 50 ft and 1 in. = 100 ft provide a basic supplement to the 1939 Chicago Land-Use Survey. Current data on the Sanborn Atlas maps, together with the 1949 aerial survey covering 1,300 sq miles of the Chicago region on the scale of 1 in. = 400 ft, provide satisfactory working information on land use.

The property map, on a scale of 1 in. = 50 ft and showing lot lines and divisions of each parcel of property as described in Manual No. 10, provides substantially the same information as the Sanborn Atlas maps. Mention should be made of the general problem of standardizing terminology and categories of land use for city planning purposes. Just as it is important that

[4] "Technique for a Real Property Survey," U. S. Govt. Printing Office, Washington, D. C., 1935.
[5] "Residential Chicago," Chicago Land-Use Survey, Chicago Plan Comm., Chicago, Ill., Vol. 1, 1942.
[6] "Description and Utilization of the Sanborn Map," Sanborn Map Co., Pelham, N. Y.

city base maps meet specified standards so it is essential that land-use survey terminology be standardized.

The refinement of city planning and land-use survey techniques started in 1930 with the inauguration of the publication of a series of city planning studies at Harvard University in Cambridge, Mass. These studies differed from the then existing standard references on city planning in that they represented summaries of methodical case studies of various phases of planning in representative American cities. Since 1930, the Harvard series has produced useful working guides on such subjects as building height, bulk and form, urban land uses, transition zoning, neighborhoods of small homes, design of residential areas, model planning laws, building lines and reservations for future streets, airports, parkways, land values, and aerial photography.

Harland Bartholomew, M. ASCE, made a fundamental contribution to the techniques of city planning and zoning in his book[7] which outlined a method of estimating the total area required for each particular urban use for any given future population of between 5,000 persons and 300,000 persons. This study not only provided information in one place on land used for 22 typical American cities of less than 300,000 population but, more important, by following uniform field land-use survey techniques and by using standard land-use categories, provided a beginning toward the development of more precise tools for land-use analysis. In 1930 Mr. Bartholomew emphasized the need for some standard method of land-use analysis in order that the efforts of individual cities and city planners could be coordinated. The comparison of land uses in different cities is still difficult because different planners use slightly different classifications of land use, develop their procedures for survey and analysis as they go along, and, as often as not, work under the handicap of a lack of sound technical standards. Zoning as a legal instrument to guide the development of cities can be no sounder than the basic land-use studies that precede it.

The Bartholomew report was the forerunner of a number of significant contributions toward the same end. A milestone in the standardization of land-use terminology was the decimal system of land-use classification developed by Bryant Hall for Los Angeles, Calif. His logical basic classification included ten major categories, each being further subdivided in an orderly manner. The following standard categories are included: (1) Vacant unused land; (2) open use; (3) farming; (4) residence, one to three families; (5) residence, multiple; (6) commercial land; (7) industry; (8) utility; (9) institutions; and (10) recreation. Each of these ten major groupings was again divided into ten breakdowns.

The planning profession has been working under the handicap of a lack of uniform procedures, each planner using his own methods on work which might have been facilitated by the adoption of standard methods. Because this condition is so general, it is significant to note that a start is being made toward the improvement of procedures. Particularly significant in the direction of standardizing terminology and land-use survey procedures is the

[7] "Urban Land Uses," by Harland Bartholomew, Harvard Univ. Press, Cambridge, Mass., 1932.

original contribution made in 1941 by Edward B. Wilkens[8] who suggested that land-use categories may be determined on the basis of the following: (1) The actual physical or inherent characteristics of the land itself; (2) the detriment caused to adjacent land use; (3) the type of structure erected; (4) the capacity of the use to crowd the land; (5) movement patterns of individuals or groups; (6) the services required or fostered by the activity pursued; (7) the service rendered to the community; (8) the taxable values produced; (9) the public or private ownership of, or access to, the land; (10) the nonflexible nature of public utilities and land-ownership patterns; and (11) the effects of pressure groups. Further work was done in this general direction by Mr. Wilkens under the sponsorship of the Public Administration Service.[9]

3. Population: Density, Distribution, and Characteristics.—Population data for large cities are generally recorded for census tracts and community areas on skelton base maps (wall maps) on scales of 1 in. = 1,000 ft or 1 in. = 2,000 ft. Among the items of information normally mapped are the following data: Density; racial or nationality groupings; incidence of births, deaths, and certain diseases; crime; delinquency; and economic status. The community survey project of the University of Chicago has in its files, the recorded data by census tracts, communities, and subcommunities over a period of three decades. These published findings are an outstanding example of the contribution that has been made to city planning by educational institutions.

Spot maps have been used frequently to show total population, school age population, population changes, and racial and nationality groupings.

4. The Street System.—The basic map required in the planning of the street system is the topographic map already described under "2. Land-Use Studies." The recommended scale for this map is 1 in. = 200 ft. Acceptable scales for city planning are 1 in. = 300 ft and 1 in. = 400 ft. A smaller scale is usually required for regional plans. A scale of 1 in. = 2,000 ft was used for the New York Regional Plan studies and the Philadelphia (Pa.) regional studies. This same scale is being used for major thoroughfare studies in the City of Chicago. The Cleveland (Ohio) Regional Geodetic Survey, on the other hand, used the scale of 1 in. = 200 ft as a basis for regional highway and expressway planning, which conforms to the general specifications in Manual No. 10. This survey provides 2-ft contour intervals and shows all buildings including residences, but does not show garages. Aerial mosaics are particularly useful in the study of future street and highway rights of way. Survey maps provide information on traffic flow, origin and destination, accidents, street jogs and dead ends, street widths, street grades, railroad grade crossings and grade separations, location of traffic signals, and parking facilities.

Preliminary highway and expressway locations and design studies are often prepared at a scale of 1 in. = 50 ft.

5. Traffic, Parking, and Transit.—Studies of a general nature in large cities like Chicago can be shown on maps at a scale as small as 1 in. = 2,000 ft. More detailed studies are made at 1 in. = 200 ft, with intersection studies

[8] "The Planning Approach to Categories of Land Use," by Edward B. Wilkens, *Journal*, American Inst. of Planners, July-September, 1941, p. 20.

[9] "Mapping for Planning," by Edward B. Wilkens, *Publication No. 101*, Public Administration Service, Chicago, Ill., 1948.

showing signals, signs, safety zones, and so forth, on the scale of 1 in. = 20 ft. Data commonly shown on traffic-study maps include vehicular and pedestrian traffic counts in congested districts, location of accidents, street obstructions, and one-way streets.

Parking survey maps that show street parking facilities and off-street parking facilities vary in scale depending on the extent of the area being studied. Maps are prepared to show potential off-street parking sites; vacant lands, both public and private; obsolete buildings; etc. Transit survey maps show present transit routes, proposed extensions, service areas, time zones, fare zones, and flow maps. Large-scale maps of central business districts facilitate the detailed study of transit problems.

6. Transportation.—In all large cities and particularly in railroad centers, such as Chicago, the location of railroad routes and facilities is a factor of basic importance in all city planning studies. For typical railroad studies, maps are suggested as follows:

a. Map of general routes of entry and location of terminals (scale, 1 in. = 3,000 ft).

b. Map of general route studies in relation to neighborhood and community planning (scale, 1 in. = 1,000 ft).

c. Composite map of main tracks, joint tracks, sidings, industrial spurs, freight yards, coach storage, engine houses, team tracks, freight houses, grade crossings, grade separations, etc. (scale, 1 in. = 250 ft or 1 in. = 200 ft).

d. Detail map of tracks, buildings, rights of way, section lines, and boundaries of other railroad properties adjacent to rights of way. In this category are the standard right-of-way and track maps prepared by the railroads in connection with property valuation by the Bureau of Valuation of the Interstate Commerce Commission. A variety of details appear on such maps (scale, 1 in. = 100 ft).

e. Special project maps may be required for detailed studies of passenger and freight terminals, grade separations, and industrial development. (Ordinarily a scale of 1 in. = 100 ft is sufficient but when numerous details are required, a scale of 1 in. = 50 ft may be found necessary.)

f. Maps that show densities of freight and passenger traffic are usually on a distorted scale, the amount of lateral distortion being dependent on the volume of business and the area covered.

The planning of both water-terminal and air-terminal facilities should be carefully coordinated with highway, railroad, and transit plans. A convenient scale for master plan studies for transportation in a large city is 1 in. = 2,000 ft.

7. Public Utilities: Water, Sewerage, Gas, and Electricity.—The topographic map on the scale of 1 in. = 200 ft is a useful map for master plan studies of public utilities. Regional studies on scales of 1 in. = 2,000 ft and 1 in. = 3,000 ft include topography, land uses, highway system, and population distribution. Aerial photographs are useful in indicating the built-up areas of the urban region and the general character of development. ASCE Manual

No. 14,[10] published in 1937, recommends detailed atlas sheets on the scale of 1 in. = 20 ft and special intersection maps on the scale of 1 in. = 10 ft in highly developed and congested business districts. The master plan map for a single utility may be plotted on the scale of 1 in. = 200 ft. This map shows the size and location of all elements in the system, together with proposed extensions.

The planning of public utilites should be coordinated with zoning and the land-use plan to insure adequate service in all sections of the city.

8. Housing and Redevelopment.—The technique for conducting housing surveys has been standardized largely under the direction of federal agencies. Real property surveys oriented in large part to the study of housing problems have been made in more than 250 cities in the United States. Many of these surveys have followed the "Technique for a Real Property Survey."[4]

A basic housing survey such as that recorded in Chicago in 1942[5] includes information on a block basis. This information is included in the report on the scale of 1½ in. = 1 mile. Work maps on the scale of 1 in. = 250 ft are on file at the Chicago Plan Commission.

Maps are included for the following: Median rental, median year built, value of single-family structures, race, condition, median duration of occupancy, conversion and rooms, housing conditions, sanitary facilities, overcrowding, vacancies, owner occupancy, single-family structures, and control (number of structures and dwelling units). Although the commercial and industrial phases of the Chicago Land-Use Survey were not completed, the following schedule of information would indicate the content of such a survey. Block maps reproduced on a scale of 1½ in. = 250 ft would include rent profile, median annual store rental, availability status of vacancies, type of vacancies, amount of vacant business floor area, movement of business, median year built, average value of business structures, condition, working population, median duration of occupancy, hotels and rooming houses, ratio of owner occupancy, control (number of structures and business units), chain stores, transfer corners, class of business, percentage of retail establishments, and percentage of manufacturing establishments.

The redevelopment studies being conducted (in 1950) by the Chicago Plan Commission involve the use of maps at several scales: First; city-wide maps on a scale of 1 in. = 2,000 ft; second, land-use maps on a scale of 1 in. = 250 ft; third, generalized study maps on the scale of 1 in. = 500 ft. The South Central Redevelopment Area plan is drawn on a scale of 1 in. = 250 ft. Special highway studies were made using maps on a scale of 1 in. = 100 ft. Both the Sanborn Atlas maps and the 1949 Chicago Aerial Survey map have been indispensable in showing trends in development since 1940 when the land survey was made.

9. Recreation.—General city-wide maps required for a recreation survey of a large city can be on scales of 1 in. = 800 ft, 1 in. = 1,000 ft, or 1 in. = 2,000 ft depending on the size of the city. Survey maps should include the following information: Topography, existing and proposed land use, vacant area, zoning districts, street traffic flow, transit routes, spot map of pedes-

[10] "Location of Underground Utilities," *Manual of Engineering Practice No. 14*, ASCE, New York, N. Y., 1937.

trian fatalities, community and neighborhood boundaries, types of planning areas, population growth, population density, school population, existing school and recreation area locations, areas not served by local playgrounds and parks, community parks and large city parks, neighborhood recreation area deficiency (in acres), community recreation area deficiency, large parks (existing and proposed), and private recreation facilities.

In the smaller cities, the base map might vary in scale from 1 in. = 200 ft to 1 in. = 600 ft. In a large city, like Chicago, square mile maps on scales of 1 in. = 200 ft or 1 in. = 250 ft would be needed in studying specific sites.

10. Subdivision Control.—ASCE Manual No. 16[11] specifies the following maps: Preliminary plat on a scale not exceeding 1 in. = 100 ft; and vicinity map on a scale not exceeding 1 in. = 400 ft that shows all existing subdivisions, street and tract lines of acreage parcels, and proposed street connections between the subdivisions that are being submitted and the adjoining areas.

The preliminary plat shows (among other information) contours at 5-ft intervals or less; location, widths, and names of all existing or platted streets within or adjacent to the tract; existing permanent buildings; railroad rights of way; section lines; political subdivisions or corporation lines; school district boundaries; and existing sewers, water mains, culverts, and other underground structures within and adjacent to the tract.

The final plat is drawn on a scale not exceeding 1 in. = 100 ft, and shows the boundary lines with accurate distances and bearings, the exact location and width of all existing or recorded streets that intersect the boundary of the tract, true bearings and distances to the nearest established street lines or official monuments, the exact location of the subdivision in reference to the county real estate records, and the exact layout of the subdivision.

11. Public Buildings.—City-wide maps of all public buildings, including schools, fire and police stations, libraries, and public administration buildings may be on a scale of 1 in. = 1,000 ft. More detailed site planning studies require a larger scale. Convenient scales are 1 in. = 50 ft, 1 in. = 60 ft, and 1 in. = 100 ft.

Specific site planning factors, such as topography, influence choice of scale and details to be included on site plans for public buildings.

12. Capital Improvement Program.—Improvements may be presented by maps showing all major projects by type. A scale of 1 in. = 1,000 ft is convenient for such a city-wide map. A great variety of maps might be used in connection with the presentation of the capital improvement program.

Photogrammetric Methods for City Surveys[12]

During the period from 1928 to 1948, aerial photography and photogrammetry have emerged as widely accepted supplementary surveying and mapping procedures. Although no photogrammetric method can be considered the answer to all mapping problems, or a complete substitute for standard ground-surveying techniques, photogrammetry now must be recognized as a basic and useful tool to supplement other standard methods. In many cases, a combination of photogrammetry and ground surveys produces the best result. In

[11] "Land Subdivision," *Manual of Engineering Practice No. 16*, ASCE, New York, N. Y., 1939.

[12] "Economics of Photogrammetry," by Leon T. Eliel, *Transactions*, ASCE, Vol. 111, 1946, p. 567.

addition to developing and using photogrammetry in the preparation of contour maps, city planners particularly should become more familiar with the many uses of aerial photography and mosaic maps, since they are now only generally acquainted with the various categories of usefulness of these new aerial tools. It may be convenient to summarize the various applications of photogrammetry and aerial photography to city planning problems, in:

(1) New subdivision layouts;
(2) Replotting of old and new streets;
(3) Location of recreation sites;
(4) Redevelopment studies;
(5) Selection of sites for hospitals, laboratories, and public buildings;
(6) Industrial land use and material storage;
(7) Traffic flow studies;
(8) Transportation studies;
(9) Accident studies;
(10) Conferences, printing, and reports;
(11) The planning of sewerage and disposal plants;
(12) Flood-control structures; and
(13) Drainage structures.

From the foregoing list it will be seen that there are few, if any, phases of modern city planning that cannot benefit from use of maps produced by the photogrammetric process.

The principal methods employed in the preparation of topographic maps by photogrammetry were effectively outlined in detail by Leon T. Eliel in 1945:[13]

> "Today in the United States it is probable that nearly all topographic mapping is being done by photogrammetric methods. The U. S. Geological Survey is the only organization among many now engaged upon the federal mapping program that still utilizes the plane-table method to any extent. This organization operates what is probably the largest multiplex unit in the world, so that even within the Geological Survey a large percentage of the total work is being done by photogrammetric methods. Other federal organizations and private organizations under contract to the government use the photogrammetric methods almost exclusively.
>
> "* * * Photogrammetry has finally arrived at the age of full maturity. Although the methods will unquestionably continue to improve from year to year, they are already thoroughly practicable, and afford a tool which will find continuing and increased acceptance at the hands of thoughtful engineers."

In discussing photogrammetry, engineers should not lose sight of the many applications of aerial photography. A great many more miles are studied usefully from aerial photographs and mosaics than from contour maps.

Use of Aerial Topographic Maps by Operating Agencies

The experience of the operating agencies of the city government in New Rochelle, N. Y.,[14] with aerial topographic maps, indicates a wide range of uses.

[13] "Economics of Photogrammetry," by Leon T. Eliel, *Transactions*, ASCE, Vol. 111, 1946, p. 576.

[14] "How New Rochelle, N. Y. Uses Aerial Topographic Maps," by Thomas B. Ray, *American City*, August, 1949, p. 86.

These maps show 5-ft contours on the scale of 1 in. = 200 ft, and were used in the design of sanitary sewer and storm drain facilities at a great saving in time and man power.

The maps were used also in snow removal and street sanding operations and in revising routes of garbage collection equipment. The Bureau of Parks, Docks, and Harbors used the maps for studies of waterfront improvements and in the selection of future recreation areas.

Inspectors of the Department of Public Health used the maps as an aid in making sanitary surveys and studies of the extent of sewage pollution in bathing waters, streams, and reservoirs. Other operating agencies that have used these maps include the Police Bureau, the Fire Bureau, the Building Inspector's Office, and the Board of Education. The Bureau of Engineering uses the aerial topographic map continuously in working with private real estate developers on subdivision planning.

The experience in New Rochelle indicates that it would be difficult to conceive of a more widely used municipal investment than an aerial photographic map.

Summary

In suggesting that a more general agreement as to mapping and surveying requirements for modern city planning will facilitate the work of a typical planning program, this paper is not intended to recommend a rigid mold into which a planning office must fit its particular mapping requirements. It is suggested, however, that reference to some standard practice may assist any planning office in establishing more precisely its own mapping specifications. It is hoped that discussion may test the general validity of the idea that some framework of mapping procedures would be helpful in any planning office. Precisely what that framework should be will, it is hoped, be more clearly stated in any future revision of ASCE Manual No. 10.

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